



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁷ : A23K 1/16, 1/18, A23C 21/04	A1	(11) International Publication Number: WO 00/48474 (43) International Publication Date: 24 August 2000 (24.08.00)
(21) International Application Number: PCT/EP99/01007 (22) International Filing Date: 17 February 1999 (17.02.99) (71) Applicant (for all designated States except US): AMYLUM BELGIUM N.V. [BE/BE]; Burchtstraat 10, B-9300 Aalst (BE). (72) Inventor; and (75) Inventor/Applicant (for US only): DE LAPORTE, André, Herman, Johan [BE/BE]; Konig Albertlaan, 12, B-9840 De Pinte (BE). (74) Agent: LEHERTE, G.; K.O.B. N.V., Kennedypark 31c, B-8500 Kortrijk (BE).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i>
(54) Title: CALF MILK REPLACER (57) Abstract <p>The invention relates to milk replacer compositions comprising: from 1–20 parts by weight of vegetable protein concentrate or isolate; and from 8–20 parts by weight of a carbohydrate source comprising 10–90% processed starch and 90–10% maltodextrin, together with whey powder and/or delactosed whey powder and/or whey protein concentrate, fat and additives.</p>		

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CALF MILK REPLACER

Introduction :

This invention relates to "zero milk" calf milk replacer
5 compositions containing high levels of vegetable protein
and carbohydrates.

State of the art :

The use of calf milk replacers in calf feeding is a well
10 established practice. Basic ingredients are skimmed milk
powder and vegetable or animal fats. Because of
increasing shortages and increasing prices of skimmed
milk powder, alternatives have been sought to replace
part or the whole of the skimmed milk component. At
15 first by-products of the milk industry, such as whey
powder, delactosed whey powder, whey powder concentrate
and/or casein have been used to replace the skimmed milk
powder. Also vegetable proteins, such as modified wheat
gluten and soy protein isolates or concentrates have been
20 used as replacement proteins for the milk proteins.

Other ingredients used in such calf milk replacers are
a.o. lactose, starch, dextrose or wheat flour. The
starch and wheat flour can be pre-processed by extrusion,
25 heat moisture treatment and/or enzyme treatment. When
using non-dairy protein sources, essential amino acids
may be added to re-equilibrate the amino acid spectrum of
the compositions.

30 Because nowadays dairy by-products, such as whey powders
and whey concentrates are finding more profitable outlets
in human nutrition, prices of these by-products increase,

making these materials less attractive for feed applications.

Therefore there is a need for ingredients applicable in
5 calf milk replacers, especially in "zero milk"
compositions, which are able to replace skimmed milk
powder and also a part of the whey based ingredients.
However, replacement of milk-based ingredients by
vegetable protein and carbohydrate sources should not
10 result in reduced feed performance compared to the
standard calf milk replacer compositions. Feed
performance parameters concerned are a.o. feed conversion
and drinking refusals. Drinking refusals are considered
to become serious when more than 2% of the fodder is not
15 consumed during the feeding periods. In the case of calf
milk replacers based on skimmed milk powder, typical
values of < 1% are observed.

20 Typical "zero milks" are composed of whey powder in
combination with whey protein concentrates or a vegetable
protein source, a fat source and a carbohydrate source.
Carbohydrates can be added as lactose, dextrose or,
starch or as a mixture thereof. Such zero milks have
25 already been disclosed in EP-0 446 987.

Further substitution of the whey powder in these zero
milk's, by a vegetable protein source and a carbohydrate
source is considered as economically attractive, because
30 of the lower price of some of these ingredients, provided
that drinking refusals and feed conversion do not
substantially deviate from the standard values. Less than

2% refusals are considered as acceptable; values above 2 and 3% are considered as unacceptable.

However, during testing of zero milks with reduced whey contents, applicants observed significant increases in drinking refusals when part of the whey powder fraction was replaced by a non-milk protein/carbohydrate whey replacer.

Typical protein sources which can be used in these whey replacers are vegetable proteins such as native or modified wheat gluten, soy proteins or other suitable vegetable protein concentrates. Carbohydrate sources which can be used are e.g. pregelatinised or degraded starch, maltodextrins, corn syrup solids or dextrose. As a carbohydrate/protein mixture extruded wheat flour has been described as a substitute for whey powder.

Within the framework of applicant's research to find a solution for the above problem, it has now surprisingly been observed that the increased number of drinking refusals returned to normal when, instead of using a single carbohydrate source such as starch or maltodextrin, the carbohydrate part of the whey replacer was composed of a combination of processed starch and maltodextrin. It can thus be stated that a synergistic effect occurs when combining a processed starch with a maltodextrin.

Description of the invention :

Accordingly this invention relates to calf milk replacer compositions, containing substantially no skimmed milk

powder, and which are characterised in that they comprise:

- from 1-20 parts of vegetable protein concentrate or isolate

5 - and from 8-20 parts of a carbohydrate source comprising 10-90% processed starch and 90-10% maltodextrin,

together with whey powder and/or delactosed whey powder and/or whey protein concentrate, fat and additives.

10 The vegetable protein part can be a.o. a modified wheat gluten, soy isolate or concentrate, or other suitable vegetable protein concentrates, or mixtures thereof. The modified wheat gluten used can be enzymatically modified, chemically modified, deamidated, or extruded wheat
15 gluten, or a mixture thereof.

The processed starch component can be an extruded starch, an enzymatically degraded starch, a (pre)gelatinised starch or a mixture thereof. The starch component can be provided by means of an extruded cereal flour.

20 Preferably the starch component is originating from extruded wheat flour.

The maltodextrin component is characterised by its DE-value which can vary between 10 and 35. Preferably a maltodextrin having a DE between 12 and 20 is used.

25

In a preferred embodiment of the invention the vegetable protein component is a modified wheat gluten protein.

In a more preferred embodiment of the invention the modified wheat gluten fraction is composed of 1-10 parts
30 extruded wheat gluten, originating from extruded wheat flour, and 99-90 parts of an enzymatically degraded and/or a deamidated wheat gluten.

In another preferred embodiment of the invention the carbohydrate source is composed of 30-70% processed starch and 70-30% maltodextrin.

5 In a further preferred embodiment of the invention the zero milk composition contains from 1-18 parts of an enzymatically degraded or a deamidated wheat gluten, in combination with 10-20 parts of a carbohydrate source composed of 30-70% extruded wheat flour and 70-30% maltodextrin having a DE between 12 and 20.

10 In a most preferred embodiment of the invention the carbohydrate source is composed of 40-60% processed starch and 60-40% maltodextrin, having a DE between 12 and 20.

15 For a better understanding of the invention, the following example, illustrating the invention, is provided.

Example :

20 A feeding trial was performed using five groups of 14 bull calves having a starting weight of about 50 kg. The calves were first fed with a skimmed milk based starter composition, during the first six weeks of the trial. This starter composition was then gradually replaced,
25 respectively by a grow reference, and by compositions 1, 2a, 3a and 4a as displayed in table I at page 7.

After the seventh week no more starter was fed. From the ninth week on compositions 2a, 3a and 4a were gradually replaced by compositions 2b, 3b and 4b. Composition of
30 these milk replacers is also given in table I at page 7. Feeding was continued until the 18th week.

At the end of the trial, in total 180 kg of the different compositions were fed to the animals.

The different feed compositions are defined as follows :

- 5 - Reference : standard skimmed milk powder based calf milk replacer composition, fed to reference group.
- Composition 1 : zero milk where skimmed milk powder is replaced by whey based products and modified wheat gluten (fed to group 1).
- 10 - Composition 2a & 2b : part of the whey based products from composition 1 is replaced by extruded wheat flour (fed to group 2).
- Compositions 3a & 3b : part of the whey based products from composition 1 is replaced by a maltodextrin/
- 15 modified wheat gluten composition in a ratio of 85/15, (fed to group 3).
- Compositions 4a & 4b : compositions according to the invention; part of the whey based products from composition 1 is replaced by a mixture of extruded
- 20 wheat flour, modified wheat gluten and maltodextrin (fed to group 4).

During the rearing period drinking refusals were noted and added up. For the different groups the following

25 results were obtained.

	Reference	Group 1	Group 2	Group 3	Group 4
Fodder refused (kg)	1,0	0,6	7,0	4,3	0,4
Refusals (%)	0,5	0,3	3,9	2,4	0,2

TABLE I
Composition of milk replacers

Parts	Reference	Comp.1	Comp.2a	Comp.3a	Comp.4a	Comp.2b	Comp.3b	Comp.4b
Skimmed milk powder	50	--	--	--	--	--	--	--
Whey powder	21,8	41,8	46,1	46,1	46,1	35,9	35,7	35,8
Whey powder conc. I 1)	--	8	--	--	--	--	--	--
Whey powder conc. II 2)	--	10,7	--	--	--	--	--	--
Fat (anim.veget. 50/50)	19	18,6	20,8	20,8	20,8	20,8	20,8	20,8
Modified wheat gluten	--	15	15,6	17,1	16,6	15,6	18,6	17,1
Wheat flour	5	3	--	--	--	--	--	--
Extruded wheat flour	--	--	10	--	5	20	--	10
Maltodextrin /modified wheat gluten composition (85/15)			--	8,5	4	--	17	8,5
Premix 3)	4,2	3	7,5	7,5	7,5	7,7	7,9	7,8
Total	100	100	100	100	100	100	100	100

1) Whey powder concentrate with a protein content of 35%

2) Whey powder concentrate with a protein content of 17%

3) special premix for cattle fodder : composition of vitamins, minerals (a.o. calcium and phosphate salts), and amino acids (lysine, threonine, methionine)

C L A I M S

- 5 1. Milk replacer composition comprising :
 - from 1-20 parts by weight of vegetable protein
 concentrate or isolate
 - and from 8-20 parts by weight of a carbohydrate
10 source comprising 10-90% processed starch and 90-10%
 maltodextrin,
 together with whey powder and/or delactosed whey
 powder and/or whey protein concentrate, fat and
 additives.
- 15 2. Milk replacer composition according to claim 1,
 characterised in that the vegetable protein part
 comprises modified wheat gluten, soy isolate or
 concentrate, or mixtures thereof.
- 20 3. Milk replacer composition according to claim 2,
 characterised in that the modified wheat gluten
 comprises enzymatically modified, chemically
 modified, deamidated, or extruded wheat gluten, or a
 mixture thereof.
- 25 4. Milk replacer composition according to any one of the
 preceding claims, **characterised in that** the processed
 starch component comprises an extruded starch, an
 enzymatically degraded starch, a (pre)gelatinised
30 starch or a mixture thereof.

5. Milk replacer composition according to any one of the preceding claims, **characterised in that** at least part of the starch component is an extruded cereal flour, extruded wheat flour.
- 5 6. Milk replacer composition according to any one of the preceding claims, **characterised in that** the maltodextrin component has a DE-value between 10 and 35, preferably a between 12 and 20.
- 10 7. Milk replacer composition according to any one of claims 2 - 6, **characterised in that** the vegetable protein component is a modified wheat gluten protein.
- 15 8. Milk replacer according to claim 7, **characterised in that** the modified wheat gluten fraction comprises 1-10 parts extruded wheat gluten from extruded wheat flour, and 99-90 parts of an enzymatically degraded and/or a deamidated wheat gluten.
- 20 9. Milk replacer composition according to claim any one of the preceding claims, **characterised in that** the carbohydrate source comprises 30-70% processed starch and 70-30% maltodextrin.
- 25 10. Milk replacer composition according to claim 9, **characterised in that** it comprises from 1-18 parts of an enzymatically degraded or a deamidated wheat gluten, in combination with 10-20 parts of a carbohydrate source composed of 30-70% extruded wheat flour and 70-30% maltodextrin having a DE between 12 and 20.
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11. Milk replacer composition according to claim 10,
characterised in that the carbohydrate source
comprises 40-60% processed starch and 60-40%
5 maltodextrin having a DE between 12 and 20.

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 99/01007

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A23K1/16 A23K1/18 A23C21/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A23K A23C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

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Date of the actual completion of the international search

22 October 1999

Date of mailing of the international search report

05/11/1999

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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